

tion on the prevalence and severity of Acute Mountain Sickness at various altitude ranges, with the risk index adjusted for factors such as gender, work intensity, etc. The decision aids not only provide risk estimates, but also allow end-users to track acclimatization status in real time in such a way that it will facilitate work intensity to be adjusted to reduce user risk. One embodiment of the decision aid tool disclosed herein will provide customized altitude acclimatization protocols, track acclimatization status, and give estimates of altitude sickness risk and work performance decrements for a wide range of altitude ascent profiles.

[0015] Presently, no software application or other process exists that provides estimations of altitude acclimatization status based on likelihood of altitude sickness and the magnitude of work impairment. This invention presents novel and non-obvious integration of predictive statistical models of altitude acclimatization status in a wearable device and/or as part of a networked system that automatically tracks a subject's altitude exposure and provides real-time estimates of altitude acclimatization for a wide range of possible target or operation altitudes. Moreover, whereas the prior art was limited in that the available guidance on altitude acclimatization is based largely on mitigating the risk of developing altitude sickness, various aspects of the present invention add the capability of estimating altitude status as a function of work performance at a given high altitude.

[0016] By automating a function that has previously been done using laborious and time intensive methods or even guesswork, this invention represents the next generation of high-altitude effects management.

[0017] The AIAMDA is of modular design, comprising of at least one module supporting a specific outcome metric such as, for example: altitude acclimatization management and status, acute mountain sickness estimation, and physical work performance estimation. Detailed description of various embodiments of the modules comprising the AIAMDA are provided below.

[0018] This invention provides users with state of the art guidance for risk management of high altitude stress: altitude illness, altitude work performance, and altitude acclimatization. The invention can be used in both planning missions/activities at high altitudes and real time management of high altitude exposure to effectively induce altitude acclimatization. In the planning phase, the decision aid will provide the user with estimates of risk of altitude illness and work performance decrements for a given ascent profile to a target altitude. In the planning phase, this decision aid can be used to compare the benefits (i.e., risk reduction) associated with alternative ascent profiles. With better estimates of risk, the user can appropriately resource their activity to manage the risk. The invention can be used to develop altitude acclimatization plans for mitigating the risk of altitude illness and work performance decrements, and in real time with appropriate user inputs can estimate current altitude acclimatization status.

[0019] Presently, no software application or other process, system or apparatus exist that provides the estimations of altitude illness, acclimatization status and work performance. A novel feature of this invention is the integration of our novel and non-obvious predictive models of altitude illness, work performance, and acclimatization status in a software application providing an end-user with new capabilities to estimate

risk of altitude illness, work performance decrements, and altitude acclimatization in a single, multifunction, user-friendly application.

[0020] The invention addresses several shortcomings associated with the current state of the art for predicting the prevalence and severity of AMS and managing acclimatization status in pre-mission planning and during ongoing operations. The prior art is limited to fixed and narrow time parameters, whereas the various models embodied in this invention allow for a dynamic range of time, altitudes and confounding parameters all of which continuously adjust the risk assessment and management data in real-time.

[0021] It is an object of the present invention to provide for predictive models of disease and illness prevalence in general and AMS prevalence, onset and symptom severity following rapid ascent to altitude in particular.

[0022] It is another object of the present invention to provide for predictive models of physical performance capabilities following rapid ascent to altitude.

[0023] It is yet a further object of the present invention to provide for probabilities of AMS prevalence and severity following rapid ascent to altitude.

[0024] Certain embodiments of this invention are designed to integrate with physiological status monitoring systems such as that disclosed in U.S. patent application Ser. No. 10/595,672 which is incorporated herein by reference in its entirety.

[0025] Certain embodiments of this invention are designed to be used in conjunction with a personal altitude acclimatization monitor (PAAM) as further described herein.

[0026] It is a certain object of this invention to provide a system for maintaining automated, real-time, precise assessments of current altitude acclimatization status.

[0027] It is another object of this invention to present the predicted acclimatization status to a user as a function of both time and a selected operational altitude in order to capture the dynamic nature of altitude acclimatization.

[0028] It is another object of this invention that the user be able to retrieve information generated and stored on the disclosed system through the use of visually displayed screens in both text and graphic formats for easy interpretation and readability.

[0029] It is yet another object of this invention to allow managers and decision-makers the capability of estimating altitude acclimatization status as a function of work performance at a given operational altitude.

[0030] In various embodiments of this invention, the predictive model or models are designed to accept data relating to the individual characteristics of rapid ascent, unacclimatized personnel operating at low and high levels of physical activity.

[0031] In various other embodiments of this invention, the predictive model or models are designed to consider data comprising at least (and not necessarily limited to) one or more of the following categories: subject demographics, sex, age, resident altitude, rate of ascent, operational altitude, work intensity, duration of exposure at operational altitude, AMS symptom severity scores, data collection time-points, physical performance assessment metrics, cognitive performance assessment metrics, specialized skill performance assessment metrics, ventilation, blood & urine parameters, pulse oximetry, medications, VO₂ Max, Body-Mass Index, actigraphy, diet, descriptive predictors (i.e. fitness level), physiological predictors (e.g., sea-level PETCO₂, resting